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A NEW DIATOM.

BY T. CHALKLEY PALMER.

In April and May of 1905, and at about the same season in later years, gatherings from swampy pools near Media, Pa., often showed little groups of freely motile naviculoid diatoms. These groups attracted notice from the curious circumstance that they seemed always composed of four individuals. Also, they were essentially unlike any filamentous forms such as *Eunotia* and *Melosira*, and differ equally with the short blocks of *Gomphonema*, *Stauroneis*, etc., which may temporarily remain in contact after reduplication. All of these, and with them the chains or bands of infinitesimal Naviculæ of the group *Diademesmis*, are alike in that the contact between adjacent frustules is by the joining of valve to valve. But these were joined girdle to girdle, so that the group as a whole moved about with four parallel raphes in approximate contact with the substratum, while four other parallel raphes were in evidence on the top. Staining with Bismarck brown and tannin showed each group to be enclosed in a mass of coleoderm. This coleoderm, of varying consistency, sometimes coagulates in place under the treatment, and sometimes, being more fluid and expanded, collapses confusedly as a brownish cloud upon the supporting slide (Plate XXXV, fig. 1).

These groups were at first supposed to constitute merely a temporary condition of some well-known species, and search was made for the same diatom in the isolated state normal to the Naviculæ, especially to the species of the *Pinnularia*¹ division of the genus, to which the form obviously belongs. But the groups have continued to occur while the isolated diatom has been nowhere visible. Moreover, a closer study of the frustule has indicated a new and curious species.

In May, 1909, rich gatherings were made of this diatom from swampy pools near Media, several miles from the places where it had first been observed in 1905. Accompanying it were a few *Navicula major* and *N. viridis* Kütz., together with vast numbers of *Closterium* sp., long strands of *Hyalotheca* sp. and other desmids. Preparations were made

¹ Treatment of the *Navicula*-*Pinnularia* question herein is that of H. Van Heurck and most recent writers except P. T. Cleve.

by various methods, and primarily by burning on the cover-glass and mounting in Canada balsam. I owe to Mr. C. S. Boyer, who received some of this material, the first intimation that these groups of four frustules may come intact through a careful boiling in nitric acid and bichromate, continued long enough to destroy entirely all accompanying organic matter, and with it, of course, that belonging to the diatoms themselves—a fact I have confirmed by repeated trials. Disintegration of groups takes place only on vigorous boiling and agitation. This indicates the grouping to be maintained by silicious cementing of the edges of the valves. The peculiar habit of growth seems persistent, and this will appear more clearly in subsequent notes of the occurrence of these groups at widely separated places. The species may be described as follows:

Navicula socialis sp. nov. Pl. XXXV, figs. 1 and 2.

Frustules normally in motile groups of four, held with girdle-sides together by a silicious cementing of adjacent valve-edges, and enclosed in a common coleoderm. Valves linear-elliptic, sides slightly concave, ends obtusely rounded. Transverse costæ prominent, nearly parallel except around terminal nodules, alike on both valves, 8 in $10\ \mu$, wider than intervening spaces, showing obscurely a longitudinal band. Raphe nearly straight and simple. Longitudinal hyaline area nearly one-third the width of valve, much contracted near terminal nodules, slightly and unsymmetrically expanded around central nodule. Length of valve, 60–120 μ , breadth 13–27 μ .

Fresh water: Swampy pools near Media, Pa. Type in cabinet of T. C. Palmer.

This species has a superficial resemblance to some forms of *Navicula viridis* Kütz. and the possibility is recognized that frustules isolated from normal grouping by usual methods of preparation may have been referred to that species. Certainly the list of forms grouped under that name by authors is long, and perhaps loose. *N. viridis*, however, which frequently accompanies this species in typical condition, always shows in marked contrast, as regards shape of valve, less parallel costæ and more curved, complex raphe, as well as in the absence of grouping into motile chains of four. *N. viridis* var. *commutata* Grunow has dissimilar valves; or, if we shall follow Cleve² in his rather puzzling rearrangement of this group of forms, var. *commutata* differs in its more approximate costæ (10 to 12 in $10\ \mu$) and their divergent tendency in the middle portion. Still following Cleve, var. *fallax*, Cleve also

² P. T. Cleve, *Synopsis of the Naviculoid Diatoms*, II, p. 91.

differs in the closer costæ (10 to 12 in $10\ \mu$) and in the frequent unlikeness of the valves by the unilateral interruption of the costæ on one of them, though there is here some agreement in the nearly parallel costæ. Neither in Cleve's descriptions, nor in the figures cited by him in Schmidt's *Atlas*³, does the present form find convincing presentation. The nearest approach is in Schmidt's *Atlas*, pl. 42, figs. 11 and 12, but even in these, which are in outline an approach, there are recognizable differences, beyond that very notable one, which applies here as well as elsewhere—the normal grouping of the species herein described into motile chains. If such grouping has been heretofore observed in related species, it does not find mention in the usual authoritative works, nor is a similar condition of *N. viridis* known to me. Mounts of the diatom having been distributed to some extent, it was interesting to find Mr. W. A. Terry able to send material from Fall Mountain, Conn., which contained it in considerable abundance. This was received in July, 1909. It showed the usual grouping, and rather larger frustules than those collected by myself. Mr. F. J. Keeley, who had made fine gatherings in May, at the same time and place as myself, collected it also in characteristic condition during the summer at Dogtown Common, Cape Ann, Mass. He also detected it in the usual groups in some of his preparations of material from near Philadelphia. Near Media it is frequent in boggy places during the summer, and until the pools dry out, though seldom in much abundance.

It goes without saying that a history of the life-cycle of this diatom, which will necessarily include an account of the formation of these groups, is much to be desired. At present it is not easy even to understand the process of ordinary reduplication in the case of this form. If the groups do not multiply by simultaneous subdivision of their constituent frustules, there would soon be irregular groupings. If the subdivision is simultaneous, good gatherings should show superposed groups. Neither of these conditions have been seen.⁴ Meantime, the practical advantage of the grouping is evident enough, so far as concerns a motility dependent to a great degree on contact of the raphe with the substratum. An isolated *Navicula* with considerable breadth of valve may easily find itself disadvantageously on its girdle, and no irregularity of the solid bottom within reach. A struggle to right itself is the usual consequence of such a condition.

³ A. Schmidt, *Atlas der Diatomaceen-Kunde*.

⁴ Occasional groups of two or three frustules will be seen in rich gatherings, and a few containing six to eight, all in one plane, have been noted. But the normal number is unquestionably four.

But the shallow, tabular group of *Navicula socialis* is in very stable equilibrium upon its four raphes, and it does not readily fall a victim to such accidents.

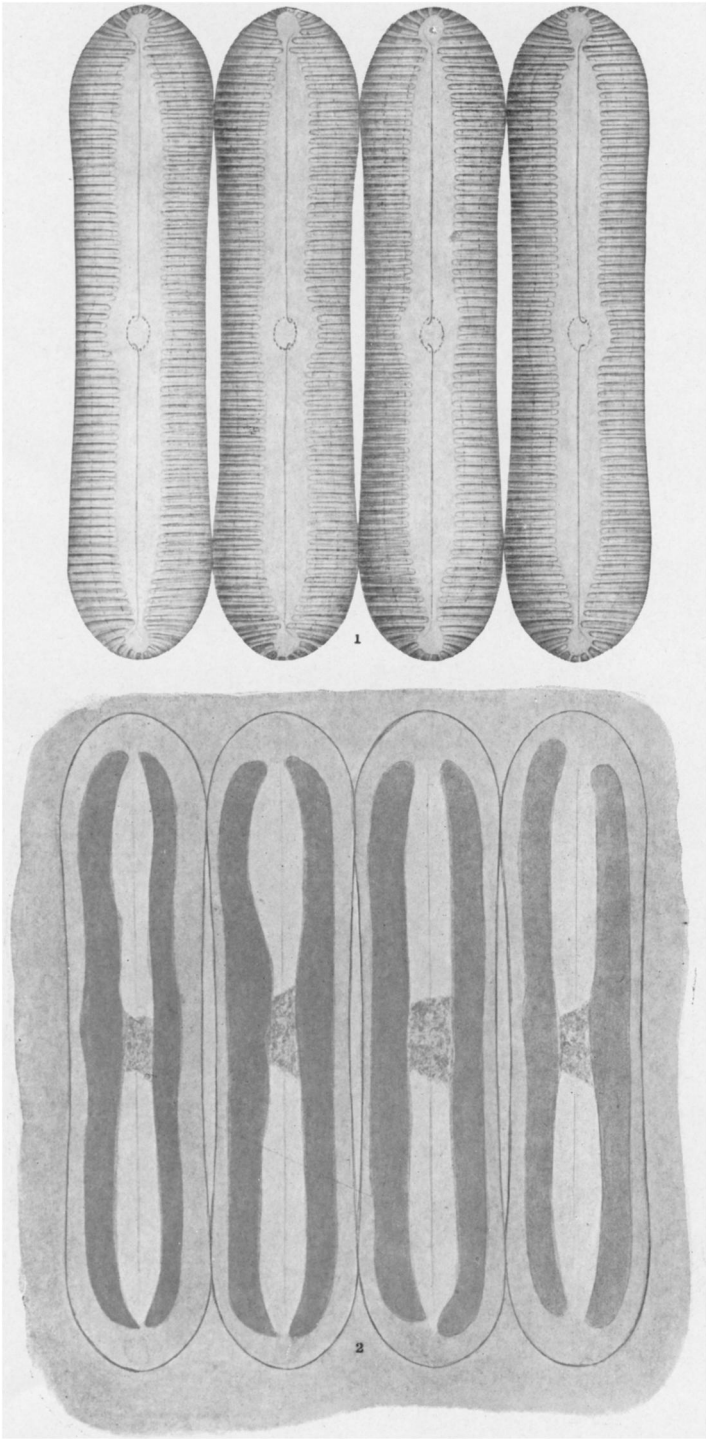
EXPLANATION OF PLATE XXXV.

Navicula socialis sp. nov.

Fig. 1—A motile group stained with Bismarck brown and tannin, showing the coleoderm, which invisibly encloses the group in life, collapsed upon the slide under treatment.

Fig. 2—A motile group burned upon the cover-glass to a low red heat, leaving only the silicious parts, and showing contact of valve-edges at six points.

Drawings are on a scale of 1000 diameters.



PALMER: NAVICULA SOCIALIS